REMARKS

1. Posture of the case

In the first Office action of April 3, 2003, claims 1 through 14 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite, under 35 U.S.C. 101 as being directed to non-statutory subject matter, and under 35 U.S.C. 103(a) as being obvious with respect to Press et al. in view of Hayami et al. The claims were responsively amended and remarks submitted on July 24, 2003 to overcome these rejections.

In the final Office action of July 27, 2004, the rejections under 35 U.S.C. 112 were withdrawn, but claims 1 through 14 were again rejected under 35 U.S.C. 101 as being directed to non-statutory subject matter and under 35 U.S.C. 103(a) as being obvious with respect to Press et al., in view of Hayami et al. Applicant responsively filed a Request for Continued Examination and submitted additional amendments and remarks to overcome the rejections in an Amendment Accompanying Request for Continued Examination.

In the present Office action, dated January 5, 2005, claims 1 through 14 are rejected under 35 U.S.C. 103(a) as being obvious with respect to Press et al., in view of Hayami et al. and a new reference, Stoer et al. Amendments are submitted herein to the claims in the present application to overcome the rejection.

2. Rejections under 35 U.S.C. 101

The present Office action has not maintained the previous rejections under 35 U.S.C. 101. Applicant takes this as indicating that the amendments submitted in the Amendment Accompanying Request for Continued Examination have overcome those rejections.

3. Rejections under 35 U.S.C. 103(a)

The teachings relied upon in Hayami et al. for the rejection are about manipulation using the associative law (in equations 19 and 20, column 9), and also about how the result of x′ can be computed or compared by multiplying M and y′. The Office action analogizes these teachings of Hayami et al. to the later part of claim 1, which states that the method includes comparing the products (lii)1*(ri)2 and (lii)2*(ri)1 for each of the unknowns, wherein said first and said second set of simultaneous linear algebraic equations are equivalent if said products match for all said unknowns. However, there are important differences between what Hayami et al. have done and

the present application. The claims in the present application are amended herein to more particularly point out such differences.

Specifically, the claims in the present application are amended herein to point out aspects of the following. In Hayami et al., if the terms aij and bi are *algebraic equations*, then Hayami et al. does not teach how it is feasible to even arrive at the sets of simultaneous linear algebraic equations expressed in the form $(l_{ii})_k\ x_i = (r_i)_k$, and thus does not teach how it is feasible to arrive at the expressions $(l_{ii})_1*(r_i)_2$ and $(l_{ii})_2*(r_i)_1$ for each of the unknowns, where the expressions $(l_{ii})_1*(r_i)_2$ and $(l_{ii})_2*(r_i)_1$ include terms from the equations $(l_{ii})_k\ x_i = (r_i)_k$ that are *algebraic expressions*, i.e., not solely numerical values. The present application does teach how this is feasible.

The present application teaches that each of the simultaneous linear algebraic equations that are originally in a form $e_{i1}x_1 + e_{i2}x_2 + e_{i3}x_3 + \ldots + e_{in}x_n = b_i$ (wherein x_j are unknowns, e_{ij} are coefficients, and b_i are quantities) are then expressed in the *algebraic*, i.e., non-numerical, form $(l_{ii})_k\ x_i = (r_i)_k$, by "iteratively eliminating said unknowns from each of said sets of simultaneous linear algebraic equations." The Office action contends that Press et al. teach this at pages 33-36, analogizing a_{44} and b_{44} to l_{ii} and r_i. However, in the context in which equations 2.3.6 and 2.3.13 appear in Press et al., pages 32-36, only y_j and x_j are algebraic variables. Thus a_{44} and b_{44} are not like the *algebraic, non-numerical* l_{ii} and r_i. Thus, neither Press et al. nor Hayami et al. teach that each of the simultaneous linear algebraic equations that are originally in a form $e_{i1}x_1 + e_{i2}x_2 + e_{i3}x_3 + \ldots + e_{in}x_n = b_i$ (wherein x_j are unknowns, e_{ij} are coefficients, and b_i are quantities) are then expressed in the *algebraic* form $(l_{ii})_k\ x_i = (r_i)_k$, by iteratively eliminating said unknowns from each of said sets of simultaneous linear algebraic equations, as claimed in the present case.

The present Office action turns to Stoer et al. for the teaching that certain coefficient matrices may have polynomials as elements and certain quantity matrices may have polynomials as elements. Applicant acknowledges that it is known for matrices to have polynomials as elements, as taught in the cited passages of Stoer et al., for example. However, this fact, even in combination with the cited teachings of Press et al. and Hayami et al., does not make it feasible, to arrive at the sets of simultaneous linear algebraic equations expressed in the form $(l_{ii})_k\ x_i = (r_i)_k$, when given simultaneous linear algebraic equations that are originally in a form $e_{i1}x_1 + e_{i2}x_2 + e_{i3}x_3 + \ldots + e_{in}x_n = b_i$. Thus, even the combination of Press et al., Hayami et al., and Stoer et al.

does not teach how it is feasible to arrive at the expressions $(l_{ii})_1*(r_i)_2$ and $(l_{ii})_2*(r_i)_1$ for each of the unknowns, where the expressions $(l_{ii})_1*(r_i)_2$ and $(l_{ii})_2*(r_i)_1$ include terms from the equations $(l_{ii})_k\, x_i = (r_i)_k$ that are algebraic expressions, i.e., not solely numerical values.

To more particularly point out that the present invention *does* make this feasible, and *how* it makes this feasible, the claims in the present application are amended herein. Stated generally, the equations and teachings of Press et al. are related is the well-known LU decomposition method, which is quite different from the Gaussian elimination method disclosed for the preferred embodiment of the present invention. In this regard, but in even more specific terms, claim 1 in the present application is amended herein to state that "certain variables in the coefficients e_{ij} and the quantities b_i of such an equation are raised to a positive integer power u, and step a) includes the following substeps for each of the equations:

a1) arranging those certain variables as u instances of the variables, each instance being raised to a power of 1 and all the instances being multiplied together;

a2) arranging expressions of such an equation resulting from substep a1) in a form <unitaryoperator><operand><operator><operand> .....<operator><operand>, where the unitary operator is either + or -, and each operator is one of +, -, or *, including inserted a unitary operator in front of the expression if an expression does not already commence the unitary operator;

a3) removing brackets of expressions of such an equation resulting from substep a2), by performing operations to render brackets superfluous, including multiplying terms inside and outside brackets, and discarding resulting superfluous brackets;

a4) substituting operators of expressions of such an equation resulting from substep a3), wherein the substituting of the operators substitutes all + operators with a string +1* and all - operators with a string -1*;

a5) converting numerical terms of expressions of such an equation resulting from substep a4) into an exponential format .[unsigned number]e[e-sign][unsigned exponent], wherein e[e-sign][unsigned exponent] for a numerical term represents a quantity 10 raised to a power [e-sign][unsigned exponent] multiplied by a number represented by .[unsigned number], such that .[unsigned number]e[e-sign][unsigned exponent] equals the numerical term, [unsigned number] being an n-digited number comprising only digits, n being a prefixed integer greater

than 0, [e-sign] being a sign of the exponent, [unsigned exponent] being an m-digited number, m being a prefixed integer greater than 0;

a6) sorting operands of terms in expressions of such an equation resulting from substep a5), wherein the sorting of the operands arranges the operands into ascending order according to a certain standardized value sequence;

a7) combining terms of expressions of such an equation resulting from substep a6) having matching variable-groups, wherein the combining of the terms includes combining the matching variable-group terms into a single term; and

a8) rearranging terms of expressions of such an equation resulting from substep a7), wherein the rearranging of the terms arranges the terms into an ascending order according to values of their respective variable-groups, wherein substeps a1) through a8) reduce such an equation to a form:

$$(l_{ij})_k\, x_j = (r_i)_k$$

wherein l_{ij} and r_i are algebraic expressions, and k={1;2} indicate one of said sets that said equation is derived from." Also, claim 1 is amended herein to state that the products that are compared are algebraic expressions, and that the eliminating said unknowns in step a) enables the comparing to determine if the products match without determining numerical values for the unknowns and without performing a matrix inversion. (Claims 4 and 7 are also amended in similar fashion, each according to the form of the invention they claim. Claims 2, 3, 5, 6, 8 and 9 are amended to conform them to their respectively amended base claims.) Press et al., Hayami et al., and Stoer et al. do not teach this, neither alone nor in combination.

No new matter is added in the amendments to the claims, since the specification as originally submitted provides support. Present application, page 7 , lines 21-24 (regarding certain variables in the coefficients e_{ij} and the quantities b_i of such an equation being raised to a positive integer power u, and arranging those certain variables as u instances of the variables, each instance being raised to a power of 1 and all the instances being multiplied together) ; page 7 , lines 25-31 (regarding arranging expressions of such an equation in a form <unitaryoperator><operand><operator><operand> .....<operator><operand>, where the unitary operator is either + or -, and each operator is one of +, -, or *, including inserted a unitary operator in front of the expression if an expression does not already commence the unitary

operator) ; page 8 , lines 1-6 (regarding removing brackets of expressions of such an equation by performing operations to render brackets superfluous, including multiplying terms inside and outside brackets, and discarding resulting superfluous brackets) ; page 8 , lines 6-13 (regarding substituting operators of expressions of such an equation, including substituting all + operators with a string +1* and all - operators with a string -1*) ; page 8 , lines 13 - page 9, line 3 (regarding converting numerical terms of expressions of such an equation into an exponential format .[unsigned number]e[e-sign][unsigned exponent], wherein e[e-sign][unsigned exponent] for a numerical term represents a quantity 10 raised to a power [e-sign][unsigned exponent] multiplied by a number represented by .[unsigned number], such that .[unsigned number]e[e-sign][unsigned exponent] equals the numerical term, [unsigned number] being an n-digited number comprising only digits, n being a prefixed integer greater than 0, [e-sign] being a sign of the exponent, [unsigned exponent] being an m-digited number, m being a prefixed integer greater than 0) ; page 9 , lines 12-23 (regarding sorting operands of terms in expressions of such an equation, including arranging the operands into ascending order according to a certain standardized value sequence); page 9 , lines 23 - page 10, line 6 (regarding combining terms of expressions of such an equation having matching variable-groups, including matching variable-group terms into a single term); page 10 , lines 8-11 (regarding rearranging terms of expressions of such an equation arranges the terms into an ascending order according to values of their respective variable-groups); and page 10 , lines 11-12, page 11, lines 21-22, page 12, line 22 - page 13, line 14 (regarding the preceding operations reducing such an equation to a form $(l_{ij})_k\, x_i = (r_i)_k)$, the products $l_{ij})_1 * (r_i)_2$ and $(l_{ij})_2 * (r_i)_1$ being algebraic expressions, and the eliminating of the unknowns enabling the comparing to determine if the products match without determining numerical values for the unknowns and without performing a matrix inversion).

In addition, it appears that the only logical connection of the cited material in Stoer et al. to the claims in the present patent application is the teaching that a certain coefficient matrix has polynomials as elements and a certain quantity matrix has polynomials as elements. Applicant contends that unless there is some more substantial connection between the teaching of Stoer et al. and the claims of the present invention, then the rejection is based merely on taking bits and pieces of the claims in the present case and applying a references simply because it mentions such bits and pieces, even though mentioned in a different and unrelated context. Applicant

contends applying references in such a disjointed fashion is impermissible hindsight reconstruction. *In re Dembiczak*, 50 USPQ2d 1614 at 1617 (Fed. Cir. 1999) ("Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability."). To establish an objective basis for the combination of the references based on the teachings of the references, those teaching must do more than merely show all aspects of the claimed invention were individually known in the art. MPEP 2143.01 (citing *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). The Office action does not offer any rationale at all for combining the Stoer et al. reference with Press et al. and Hayami et al. Therefore, Applicant contends the combination of Stoer et al. with Press et al. and Hayami et al. is not proper.

PRIOR ART OF RECORD

Applicant has reviewed the prior art of record cited by but not relied upon by Examiner, and asserts that the invention is patentably distinct.

REQUESTED ACTION

Applicant contends that the invention as claimed in accordance with amendments submitted herein is patentably distinct, and hereby requests that Examiner grant allowance and prompt passage of the application to issuance.

Respectfully submitted,

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